ESRF

ESRF	**Experiment title:** Phase transition in theophylline during the tablet formation	**Experiment number**: SC-1668
Beamline: ID02	**Date of experiment**: From: 15/6/2005 to: 18/6/2005	**Date of report**: 13/2/2006
Shifts: 9	**Local contact(s)**: Dr. T Narayanan	*Received at ESRF:*

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Report: This report describes the application of x-ray diffraction techniques to investigate the influence of excipients and compression pressure on the dehydration of theophylline monohydrate by using the synchrotron beam to map the tablet composition. It is known that theophylline monohydrate undergoes dehydration under compression to form anhydrous theophylline (Picker, K M, *Pharm. Dev. Technol.*, 6(1), 2001)

Tablets of theophylline monohydrate were prepared with or without excipients (varying proportions of microcrystalline cellulose as diluent and stearic acid as lubricant) under different compression pressures. X-ray powder diffraction patterns were recorded to map the structural variation in the tablets, which are produced under different compression pressures, with and without the excipients.

Typical powder diffraction patterns recorded from tablets containing only theophylline monohydrate are shown in figure 1. This figure shows as expected uniform distribution of theophylline monohydrate and anhydrous theophylline.

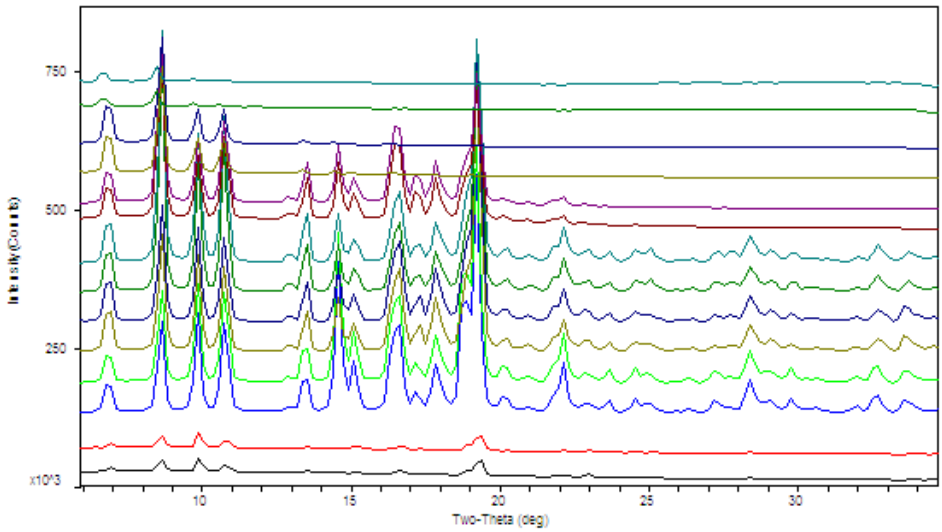

Figure 1: *Overlay of WAXS patterns of theophylline monohydrate tablets compressed at 78.4 Mpa as a function of position across the tablet with a spatial resolution of ~0.5mm.*

Typical powder diffraction patterns recorded from theophylline monohydrate in the presence of excipient are shown in figure 2. These results show that in the presence of excipient, excipient concentrations up to used in pharmaceutical processing, the concentration and compression pressure did not influence the compression-induced dehydration behavior of theophylline monohydrate and hence its pharmaceutical activity as had been previously reported by Picker (Picker, K M, *Pharm. Dev. Technol.*, 6(1), 2001).

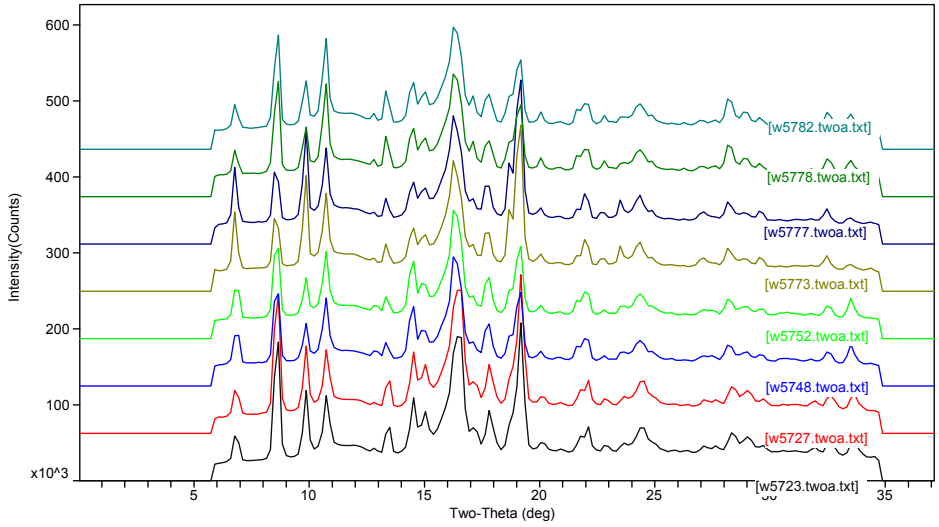

Figure 2: *Overlay of WAXS patterns of tablets prepared from theophylline monohydrate (50% w/w) and microcrystalline cellulose (50% w/w) with a compression pressure of 78.4 MPa*